



## Polycystic ovary syndrome

Polycystic ovary syndrome is a condition that affects women in their child-bearing years and alters the levels of multiple hormones, resulting in problems affecting many body systems.

Most women with polycystic ovary syndrome produce excess male sex hormones (androgens), a condition called hyperandrogenism. Having too much of these hormones typically leads to excessive body hair growth (hirsutism), acne, and male pattern baldness.

Hyperandrogenism and abnormal levels of other sex hormones prevent normal release of egg cells from the ovaries (ovulation) and regular menstrual periods, leading to difficulty conceiving a child (subfertility) or a complete inability to conceive (infertility). For those who achieve pregnancy, there is an increased risk of complications and pregnancy loss. Due to irregular and infrequent menstruation and hormone abnormalities, affected women have an increased risk of cancer of the uterine lining (endometrial cancer).

In polycystic ovary syndrome, multiple cysts in each ovary can be seen with medical imaging. These cysts are small, immature ovarian follicles. Normally, ovarian follicles contain egg cells, which are released during ovulation. In polycystic ovary syndrome, abnormal hormone levels prevent follicles from growing and maturing to release egg cells. Instead, these immature follicles accumulate in the ovaries. Affected women can have 12 or more of these follicles. The number of these follicles usually decreases with age.

About half of all women with polycystic ovary syndrome are overweight or obese and are at increased risk of a fatty liver. Additionally, many women with polycystic ovary syndrome have elevated levels of insulin, which is a hormone that helps control blood sugar levels. By age 40, about 10 percent of overweight women with polycystic ovary syndrome develop abnormally high blood sugar levels (type 2 diabetes), and up to 35 percent develop prediabetes (higher-than-normal blood sugar levels that do not reach the cutoff for diabetes). Obesity and increased insulin levels (hyperinsulinemia) further increase the production of androgens in polycystic ovary syndrome.

Women with polycystic ovary syndrome are also at increased risk for developing metabolic syndrome, which is a group of conditions that include high blood pressure (hypertension), increased belly fat, high levels of unhealthy fats and low levels of healthy fats in the blood, and high blood sugar levels. About 20 percent of affected adults experience pauses in breathing during sleep (sleep apnea). Women with polycystic ovary syndrome are more likely to have mood disorders such as depression compared to the general population.

## **Frequency**

Polycystic ovary syndrome is the most common cause of infertility due to absent ovulation. The prevalence of polycystic ovary syndrome is often reported as 6 to 10 percent of women worldwide. However, some studies report a wider range, from as low as 4 percent to as high as 21 percent of women, depending on the criteria used to make the diagnosis.

## **Causes**

The causes of polycystic ovary syndrome are complex. This condition results from a combination of genetic, health, and lifestyle factors, some of which have not been identified. Common variations (polymorphisms) in several genes have been associated with the risk of developing polycystic ovary syndrome. Because they are common, these variations can be present in people with polycystic ovary syndrome and in those without. It is the combination of these changes that helps determine a woman's likelihood of developing the disease.

Genes that are involved in many body processes are thought to play a role in the development of polycystic ovary syndrome. The main contributors are likely genetic variants that increase the production of androgen and other sex hormones such as luteinizing hormone and anti-Müllerian hormone, which both play key roles in ovulation. Other genetic variants likely involved in a decrease in follicle-stimulating hormone are thought to contribute to the poor development of follicles in women with polycystic ovary syndrome.

Other genes associated with polycystic ovary syndrome are involved in energy production, immune system responses to injury (inflammation), insulin production and regulation, and pathways involved in the production of fats.

Genetic variations likely act in combination with health and lifestyle factors to influence a woman's overall risk of developing polycystic ovary syndrome. Risk factors include diabetes, obesity, and a largely inactive (sedentary) lifestyle.

## **Inheritance Pattern**

Polycystic ovary syndrome does not have a clear pattern of inheritance, although affected individuals may have a close family member with the condition. It is estimated that 20 to 40 percent of women with polycystic ovary syndrome have an affected mother or sister. This increased familial risk is likely due in part to shared genetic factors, but lifestyle influences that are shared by members of a family likely also play a role.

## **Other Names for This Condition**

- cystic disease of ovaries
- cystic disease of ovary
- multicystic ovaries

- PCO
- PCOD
- PCOS
- polycystic ovarian disease
- polycystic ovarian syndrome
- sclerocystic ovarian degeneration
- sclerocystic ovaries
- sclerocystic ovary syndrome
- Stein-Leventhal syndrome

## **Diagnosis & Management**

### Formal Diagnostic Criteria

- Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. *Fertil Steril*. 2004 Jan;81(1):19-25.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/14711538>

### Formal Treatment/Management Guidelines

- Goodman NF, Cobin RH, Futterweit W, Glueck JS, Legro RS, Carmina E; American Association of Clinical Endocrinologists (AACE); American College of Endocrinology (ACE); Androgen Excess and PCOS Society (AES). AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS, AMERICAN COLLEGE OF ENDOCRINOLOGY, AND ANDROGEN EXCESS AND PCOS SOCIETY DISEASE STATE CLINICAL REVIEW: GUIDE TO THE BEST PRACTICES IN THE EVALUATION AND TREATMENT OF POLYCYSTIC OVARY SYNDROME--PART 1. *Endocr Pract*. 2015 Nov;21(11):1291-300. doi: 10.4158/EP15748.DSC.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/26509855>
- Goodman NF, Cobin RH, Futterweit W, Glueck JS, Legro RS, Carmina E; American Association of Clinical Endocrinologists (AACE); American College of Endocrinology (ACE); Androgen Excess and PCOS Society. AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS, AMERICAN COLLEGE OF ENDOCRINOLOGY, AND ANDROGEN EXCESS AND PCOS SOCIETY DISEASE STATE CLINICAL REVIEW: GUIDE TO THE BEST PRACTICES IN THE EVALUATION AND TREATMENT OF POLYCYSTIC OVARY SYNDROME - PART 2. *Endocr Pract*. 2015 Dec;21(12):1415-26. doi: 10.4158/EP15748.DSCPT2. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/26642102>

### Genetic Testing Information

- What is genetic testing?  
[/primer/testing/genetictesting](#)
- Genetic Testing Registry: Polycystic ovaries  
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C0032460/>

### Research Studies from ClinicalTrials.gov

- ClinicalTrials.gov  
<https://clinicaltrials.gov/ct2/results?cond=%22polycystic+ovary+syndrome%22>

### Other Diagnosis and Management Resources

- MedlinePlus Encyclopedia: Polycystic Ovary Syndrome  
<https://medlineplus.gov/ency/article/000369.htm>
- Stanford Children's Health  
<https://www.stanfordchildrens.org/en/topic/default?id=polycystic-ovarian-syndrome-pcos-85-P08334>
- UCLA Health  
<http://obgyn.ucla.edu/pcos>

## **Additional Information & Resources**

### Health Information from MedlinePlus

- Encyclopedia: Polycystic Ovary Syndrome  
<https://medlineplus.gov/ency/article/000369.htm>
- Health Topic: Polycystic Ovary Syndrome  
<https://medlineplus.gov/polycysticovarysyndrome.html>

### Genetic and Rare Diseases Information Center

- Polycystic ovarian syndrome  
<https://rarediseases.info.nih.gov/diseases/7421/polycystic-ovarian-syndrome>

### Additional NIH Resources

- Eunice Kennedy Shriver National Institute of Child Health and Human Development  
<https://www.nichd.nih.gov/health/topics/pcos>
- WomensHealth.gov  
<https://www.womenshealth.gov/a-z-topics/polycystic-ovary-syndrome>

### Educational Resources

- Center for Young Women's Health  
<https://youngwomenshealth.org/2014/02/25/polycystic-ovary-syndrome/>
- Johns Hopkins Medicine  
<https://www.hopkinsmedicine.org/health/conditions-and-diseases/polycystic-ovary-syndrome-pcos>
- MalaCards: polycystic ovary syndrome  
[https://www.malacards.org/card/polycystic\\_ovary\\_syndrome](https://www.malacards.org/card/polycystic_ovary_syndrome)
- Merck Manual Consumer Version  
<https://www.merckmanuals.com/home/women-s-health-issues/menstrual-disorders-and-abnormal-vaginal-bleeding/polycystic-ovary-syndrome-pcos>
- Orphanet: NON RARE IN EUROPE: Polycystic ovary syndrome  
[https://www.orpha.net/consor/cgi-bin/OC\\_Exp.php?Lng=EN&Expert=3185](https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=3185)
- Pediatric Endocrine Society  
[https://www.pedsendo.org/assets/patients\\_families/EdMat/second\\_batch/Polycystic%20Ovary%20Syndrome.pdf](https://www.pedsendo.org/assets/patients_families/EdMat/second_batch/Polycystic%20Ovary%20Syndrome.pdf)
- TeensHealth from Nemours  
<https://kidshealth.org/en/teens/pcos.html>
- The American College of Obstetricians and Gynecologists  
<https://www.acog.org/Patients/FAQs/Polycystic-Ovary-Syndrome-PCOS>

### Patient Support and Advocacy Resources

- Hormone Health Network  
<https://www.hormone.org/diseases-and-conditions/womens-health/polycystic-ovary-syndrome>
- National Women's Health Network  
<https://nwhn.org/polycystic-ovary-syndrome-pcos/>
- PCOS Awareness Association  
<https://www.pcosaa.org/>

### Scientific Articles on PubMed

- PubMed  
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28Polycystic+Ovary+Syndrome%5BMAJR%5D%29+AND+%28%28polycystic+ovary+syndrome%5BTI%5D%29+OR+%28polycystic+ovarian+syndrome%5BTI%5D%29%29+AND+review%5Bpt%5D+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+720+days%22%5Bdp%5D>

## Catalog of Genes and Diseases from OMIM

- POLYCYSTIC OVARY SYNDROME 1  
<http://omim.org/entry/184700>

### **Sources for This Summary**

- Helvaci N, Karabulut E, Demir AU, Yildiz BO. Polycystic ovary syndrome and the risk of obstructive sleep apnea: a meta-analysis and review of the literature. *Endocr Connect*. 2017 Oct;6(7):437-445. doi: 10.1530/EC-17-0129. Epub 2017 Jul 24.  
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*Free article on PubMed Central:* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5574283/>
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*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/27179787>
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*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/27233760>
- Zhao H, Lv Y, Li L, Chen ZJ. Genetic Studies on Polycystic Ovary Syndrome. *Best Pract Res Clin Obstet Gynaecol*. 2016 Nov;37:56-65. doi: 10.1016/j.bpobgyn.2016.04.002. Epub 2016 May 19. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/27264388>
- Ünlütürk U, Sezgin E, Yildiz BO. Evolutionary determinants of polycystic ovary syndrome: part 1. *Fertil Steril*. 2016 Jul;106(1):33-41. doi: 10.1016/j.fertnstert.2016.05.010. Epub 2016 May 26. Review.  
*Citation on PubMed:* <https://www.ncbi.nlm.nih.gov/pubmed/27238626>

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